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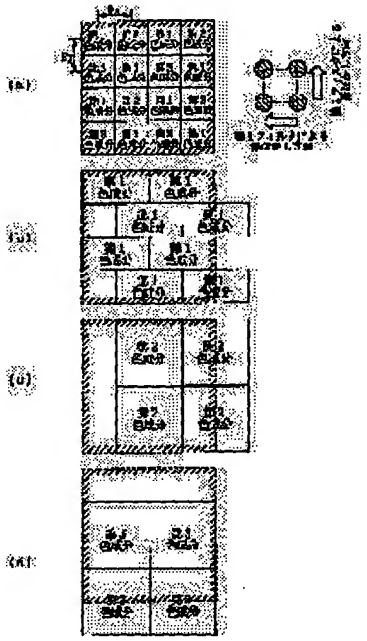
(71)Applicant : NIKON CORP
(72)Inventor : UTAGAWA TAKESHI

(54) IMAGE PICKUP DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To improve the resolution of an image pickup device and to provide the image pickup device for balancing false color reduction.
SOLUTION: In this image pickup device provided with an optical low-pass filter provided with a first filter for grading an optical image in a first direction and a second filter for grading the optical image in a second direction (including the case of being parallel to the first direction), a color filter for color- separating the optical image made to pass through the optical low-pass filter through the color array of plural colors and an image pickup means for picking up the optical image made to pass through the color filter, the color array of the color filter is the one composed by arranging a first color component in a highest density and arranging the other color components at remaining positions and the shading amount of the first color component in the second filter is smaller than the grading amount of the other color components or effectively zero.



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CLAIMS

[Claim(s)]
[Claim 1] The 1st filter which obscures a light figure in the 1st direction. The optical low pass filter which has the 2nd filter which obscures a light figure in the 2nd direction (it contains when parallel to the 1st direction of the above). The light filter which classifies by color the light figure which passed the aforementioned optical low pass filter through the color array of two or more colors. An image pck-up means to picturize the light figure which passed the aforementioned light filter. It is image pck-up equipment equipped with the above, and the color array of the aforementioned light filter is a color array which the 1st color component is most arranged at high density, and comes to arrange other color components in the remaining position, and the amount of shading ofves of the aforementioned 1st color component in the 2nd filter of the above is small compared with the amount of shading ofves of the above and other color components, or is characterized by to be efficiency top zero.
[Claim 2] The 1st filter which obscures a light figure horizontally. The optical low pass filter which has the 2nd filter which obscures a light figure perpendicularly. The light filter which classifies by color the light figure which passed the aforementioned optical low pass filter through the color array of two or more colors. An image pck-up means to picturize the light figure which passed the aforementioned light filter. It is image pck-up equipment equipped with the above. the color array of the aforementioned light filter the 1st color component — a checker — arranging — the [the 2nd color component and], when it is the Bayer array which comes to arrange 3 color components in the remaining position, the level pitch of the aforementioned color array is set to Px and a normal pitch is set to Py the 1st filter of the above — the 1st - the 3rd color component of a light figure — the aforementioned level pitch Px and abbreviation — an equal distance — horizontal — obscuring — the 2nd filter of the above — the [the 2nd color component of a light figure, and] — 3 color components — a wavelength selection — carrying out — the aforementioned normal pitch Py and abbreviation — it is characterized by obscuring only an equal distance perpendicularly
[Claim 3] The 1st filter which obscures a light figure horizontally. Level or the optical low pass filter which has the 2nd filter which obscures a light figure perpendicularly. The light filter which classifies by color the light figure which passed the aforementioned optical low pass filter through the color array of two or more colors. An image pck-up means to picturize the light figure which passed the aforementioned light filter. It is image pck-up equipment equipped with the above. the aforementioned light filter When it is constituted by the color array of the 1st color component with the highest density, and other color components, the level pitch of a color array is further set to Px and a normal pitch is set to Py, It comes to set Py as the abbreviation double precision of Px. the 1st filter of the above a light figure — the aforementioned level pitch Px and abbreviation — the color component of the above and others — a wavelength selection — carrying out — the aforementioned normal pitch Py and abbreviation — it is characterized by obscuring only an equal distance in the horizontal or vertical direction [in / a light figure / only an equal distance is obscured horizontally and / in the 2nd filter of the above]
[Claim 4] It is image pck-up equipment which, as for the color array of the aforementioned light filter, the pitch between the same colors is different from each other in the horizontal direction

and the perpendicular direction about the above and other color components in image pck-up equipment according to claim 3, and is characterized by the 2nd filter of the above being a filter which obscures the color component of the above and others of a light figure in the large direction of the pitch between the aforementioned same colors.
[Claim 5] The aforementioned image pck-up means is image pck-up equipment characterized by coming to carry out two-dimensional array of the photo detector in the pixel pitch Px on a light-receiving side in image pck-up equipment according to claim 3 or 4, and receiving the transmitted light of the 1st division fraction of the aforementioned color array by the two aforementioned photo detectors.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the image pck-up equipment which picturizes a light figure. Especially this invention relates to the technology which combines the pixel array of an image pck-up means, the color array of a light filter, and the property of an optical low pass filter the optimal.
[0002]
[Description of the Prior Art] Drawing 16 (a) is the block diagram showing conventional veneer formula image pck-up equipment. In drawing 16 (a), the optical low pass filter 82 is arranged at the image space side of the photography optical system 81. This optical low pass filter 82 is constituted by the lamination of the 1st filter 83 which carries out the birefringence of the light, 1/4 wavelength plate 84 which disturbs plane of polarization, and the 2nd filter 85 which carries out the birefringence of the light.
[0003] Behind this optical low pass filter 82, the image pck-up element 86 is arranged through a light filter 87. According to the pixel position of the image pck-up element 86, this light filter 87 is classified into the level pitch Px and a normal pitch Py, and is classified by RGB3 color by color. Drawing 16 (b) is drawing showing the color array of a light filter 87. A color array here is a color array (the so-called "Bayer array") which allotted G component to the checker and allotted R component and B component to the remainder. Drawing 16 (c) is drawing showing "the shading-off image of ****" by the optical low pass filter 82 mentioned above. An optical operation of following (1) - (3) realizes a shading-off image as shown in this view.
[0004] (1) The 2nd filter 85 carries out the birefringence of the light figure to a normal beam of light and an extraordinary ray, carry out a normal pitch Py, abbreviation, etc., a mutual image formation position is, and only distance deltay shifts perpendicularly.
[0005] (2) 1/4 wavelength plate 84 changes into the circular polarization of light etc. the linearly polarized light bisected with the 2nd filter 85, and disturbs plane of polarization.
[0006] (3) The 1st filter 83 carries out the birefringence of the light figure which passed 1/4 wavelength plate 84 to a normal beam of light and an extraordinary ray again, carry out the level pitch Px, abbreviation, etc., an image formation position is, and only distance delta x shifts horizontally. By such optical operation of the optical low pass filter 82, the light of the 4th division fraction mixes and carries out incidence to one partition of the color array shown in drawing 17 (a). Consequently, the substantial light-receiving range (this substantial light-receiving range is hereafter called "light-receiving aperture") in the 1st division fraction of a color array is expanded to an in-every-direction double-precision grade.
[0007] Drawing 17 (b) - (d) is drawing having shown the situation of such a light-receiving aperture for every RGB component. As shown in drawing, the array of the light-receiving aperture for every color component spreads in an in-every-direction double-precision grade, and fills the whole light-receiving side without a crevice. The image pck-up element 86 generates the pixel output by which smoothing was carried out for every field of these light-receiving apertures. Therefore, the high-frequency component of a light figure is oppressed certainly, and it becomes possible to suppress effectively generating of the false color in a picture output, or

moire.
[0008]
[Problem(s) to be Solved by the Invention] By the way, in such a conventional example, as shown in drawing 17 (b), the light-receiving apertures of G component overlap and are formed. Therefore, about G component, high region suppression of spatial frequency worked too much, and there was a trouble of causing the remarkable fall of resolution. Then, it aims at offering the image pck-up equipment which does not spoil resolution as much as possible in invention according to claim 1 to 5, fully suppressing a false color and moire.
[0009] Moreover, especially in invention according to claim 2, it aims at offering the image pck-up equipment which reconciled suppression of a false color, and improvement in resolution with sufficient balance in Bayer arrays, such as primary color. Furthermore, it aims at offering the image pck-up equipment which can make a light-receiving aperture into the shape of a square mostly about the 1st color component with the highest density in invention according to claim 3.
[0010] It aims at offering the image pck-up equipment in eye in addition of a claim 3 which can suppress a false color and moire certainly about other color components in invention according to claim 4. It aims at offering the image pck-up equipment in eye in addition of a claim 3 with the usable image pck-up element of a square pixel in invention according to claim 5.
[0011]
[Means for Solving the Problem] The 1st filter with which invention according to claim 1 obscures a light figure in the 1st direction, (Claim 1) The optical low pass filter which has the 2nd filter which obscures a light figure in the 2nd direction (it contains when parallel to the 1st direction), In image pck-up equipment equipped with the light filter which classifies by color the light figure which passed the optical low pass filter through the color array of two or more colors, and an image pck-up means to picturize the light figure which passed the light filter The color array of a light filter is a color array which the 1st color component is most arranged at high density, and comes to arrange other color components in the remaining position, and the amount of shading ofves of the 1st color component in the 2nd filter Compared with the amount of shading ofves of other color components, it is small, or is characterized by being efficiency top zero.
[0012] With such composition, an optical low pass filter obscures other color components in the 1st direction and the 2nd direction. Therefore, about the color component of others of a light figure, it becomes possible to fully suppress generating of a false color or moire. On the other hand, the 2nd filter has the wavelength-selection nature "whether it is smaller than the amount of shading ofves of other color components, and the amount of shading ofves of the 1st color component is efficiency top zero." Therefore, about the 1st color component, the amount of shading ofves of the 2nd direction is small, and the depressor effect of the spatial frequency in the 2nd direction is small. Consequently, about the 1st color component, it becomes possible to raise the resolution of the 2nd direction.
[0013] In addition, the 1st color component is most arranged on a light filter at high density. Therefore, the sample interval of the 1st color component in an image pck-up means is the finest, and the clinch noise mixed in the sampling signal of this 1st color component is shifted more to a high region side compared with the case of other color components. Therefore, about the 1st color component, even if it reduces the amount of shading ofves of the 2nd direction, there are few possibilities that a false color and moire may occur. while fully suppressing a false color and moire by invention according to claim 1 from the above reason -- the [and] -- spoiling the resolution of 1 color component as much as possible is lost
[0014] The 1st filter with which invention according to claim 2 obscures a light figure horizontally, (Claim 2) The optical low pass filter which has the 2nd filter which obscures a light figure perpendicularly, In image pck-up equipment equipped with the light filter which classifies by color the light figure which passed the optical low pass filter through the color array of two or more colors, and an image pck-up means to picturize the light figure which passed the light filter the color array of a light filter -- the 1st color component -- a checker -- arranging -- the [the 2nd color component and], when it is the Bayer array which comes to arrange 3 color components in the remaining position, the level pitch of a color array is set to Px and a normal

pitch is set to Py the 1st filter — the 1st – the 3rd color component of a light figure — the level pitch Px and abbreviation — an equal distance — horizontal — obscuring — the 2nd filter — the [the 2nd color component of a light figure, and] — 3 color components — a wavelength selection — carrying out — a normal pitch Py and abbreviation — it is characterized by obscuring only an equal distance perpendicularly

[0015] With such composition, the wavelength selection of the 1st color component is not carried out in the 2nd filter. Therefore, Px, abbreviation, etc. are mainly in the 1st color component by carrying out horizontally, and only distance is obscured. such a horizontal shading-off effect — the light-receiving aperture of the 1st color component — horizontal — about twice — it is extended By the way, as shown in drawing 1 (a), in a Bayer array, the 1st color component is arranged every other level partition. Therefore, by extending the light-receiving aperture of the 1st color component horizontally a 2 times as many abbreviation as this, as shown in drawing 1 (b), it becomes possible to fill up the whole light-receiving side with the light-receiving aperture of the 1st color component that there is almost no lap.

[0016] By being formed without the light-receiving aperture of the 1st color component lapping mostly in this way, spoiling the resolution of the 1st color component more than required is lost. Moreover, since a light-receiving aperture is arranged that there is almost no crevice, it becomes possible [also fully suppressing the false color produced for the 1st color component, and moire]. on the other hand — the [the 2nd color component and] — 3 color components are obscured by the level perpendicular with the 1st filter and the 2nd filter such a shading-off effect — the [the 2nd color component and] — the light-receiving aperture of 3 color components is extended by the level perpendicular abbreviation double precision (surface ratio 4 times as many abbreviation as this) every

[0017] By the way, as shown in drawing 1 (a), in a Bayer array, the 2nd color component is arranged every other every other level partition and perpendicular partition. Therefore, when the light-receiving aperture of the 2nd color component spreads abbreviation double precision every in a level perpendicular, as shown in drawing 1 (c), it becomes possible to fill the whole light-receiving side with the light-receiving aperture of the 2nd color component that there is almost no lap. Moreover, similarly, about the light-receiving aperture of the 3rd color component, as shown in drawing 1 (d), the whole light-receiving side is filled that there is almost no lap.

[0018] the array of such a light-receiving aperture — the [the 2nd color component and] — it becomes possible not to spoil resolution more than required and to fully suppress generating of a false color or moire also about 3 color components As explained above, in invention according to claim 2, it becomes possible to acquire the good picture signal which reconciled the depressor effect of a false color or moire, and the improvement effect of resolution to the maximum extent about three kinds of all color components in a Bayer array.

[0019] The 1st filter with which invention according to claim 3 obscures a light figure horizontally, (Claim 3) Level or the optical low pass filter which has the 2nd filter which obscures a light figure perpendicularly, In image pck-up equipment equipped with the light filter which classifies by color the light figure which passed the optical low pass filter through the color array of two or more colors, and an image pck-up means to picturize the light figure which passed the light filter A light filter is constituted by the color array of the 1st color component with the highest density, and other color components. Furthermore, it comes to set the level pitch Px of a color array as the abbreviation double precision of a normal pitch Py. the 1st filter a light figure — the level pitch Px and abbreviation — the color component of others [in / a light figure / only an equal distance is obscured horizontally and / in the 2nd filter] — a wavelength selection — carrying out — a normal pitch Py and abbreviation — it is characterized by obscuring only an equal distance in the horizontal or vertical direction

[0020] With such composition, as shown in drawing 2 (a), the level pitch Px of a color array is set as the abbreviation half of a normal pitch Py. Therefore, by abbreviation etc. setting the 1st color component to Px horizontally with the 1st filter, being, and obscuring only distance, as shown in drawing 2 (b), the light-receiving aperture of the 1st color component becomes square-like mostly. Therefore, about the 1st color component, it becomes possible to acquire the signal of the pixel aspect ratio 1:1 easily, without passing through complicated computations, such as

aspect conversion.
[0021] (Claim 4) As for the color array of a light filter, invention according to claim 4 is [the pitch between the same colors] different from each other in the horizontal direction and the perpendicular direction about other color components in image pck-up equipment according to claim 3, and the 2nd filter is characterized by being the filter which obscures the color component of others of a light figure in the large direction of the pitch between the same colors. With such composition, other color components are obscured in the large direction of the pitch between the same colors with the 2nd filter. Therefore, as shown in drawing 2 (c) and drawing 2 (d), the light-receiving aperture of other color components does not have a heavy bird clapper between the same colors, and does not spoil the resolution of other color components more than required.
[0022] (Claim 5) Invention according to claim 5 is characterized by coming to carry out two-dimensional array of the photo detector in the pixel pitch Px on a light-receiving side, and an image pck-up means receiving the transmitted light of the 1st division fraction of a color array by two photo detectors in image pck-up equipment according to claim 3 or 4. By such composition, the general image pck-up element which consisted of square pixels is used, and it becomes possible to realize the image pck-up equipment of a publication easily to claims 3 and 4.
[0023] In addition, in each claim mentioned above, a plain expression of "P-, abbreviation, etc. being by carrying out and obscuring only distance" is used (x or y goes into " -"). If this is said in detail, it will be about P to the original light figure. - It is the meaning of having the spatial frequency characteristics of a grade which pile up the shifted light figure. What is necessary is just to apply to the above-mentioned meaning as it is, since a light figure is generally shifted and piled up simply in the case of the optical low pass filter which used the birefringence.
[0024] On the other hand, since a high order component, bleeding (the so-called halo) of light, etc. arise in the case of the optical low pass filter which used the phase grating etc., it cannot be said that two light figures are piled up simply. However, it is about P to the light figure of "dimension by allotting the zero point of spatial frequency characteristics near [the 1/(2P-)], or performing a filter design, such as making the same a part for the shoulder of a low-pass property also in such a case. - Spatial-frequency-characteristics" of a grade which piles up the shifted light figure is realizable.
[0025]
[Embodiments of the Invention] Hereafter, the gestalt of the operation in this invention is explained based on a drawing.
[0026] (1st operation gestalt) The 1st operation gestalt is an operation gestalt corresponding to invention given in claims 1 and 2. Drawing 3 (a) is drawing showing the composition of the 1st operation gestalt. In drawing 3 (a), the optical low pass filter 12 is arranged at the image space side of the photography optical system 11. This optical low pass filter 12 is constituted by the lamination of the 1st filter 13 which carries out the birefringence of the light, 1/4 wavelength plate 14 which disturbs plane of polarization, and the 2nd filter 15 which has wavelength-selection nature.
[0027] Behind this optical low pass filter 12, the image pck-up element 16 is arranged through a light filter 17. According to the pixel position of the image pck-up element 16, this light filter 17 is classified into the level pitch Px and a normal pitch Py, and is classified by RGB3 color by color. Drawing 3 (b) is drawing showing the situation of this color array. A color array here is a color array (the so-called "Bayer array") which allotted G component to the checker and allotted R component and B component to the remainder. Drawing 3 (c) is drawing showing "the shading-off image of ****" by the optical low pass filter 12 mentioned above. An optical operation of following (1) - (3) realizes a shading-off state as shown in this view.
[0028] (1) The 2nd filter 15 carries out the wavelength selection of the RB component, and only distance deltay equal to a normal pitch Py obscures the image formation position of RB component perpendicularly. On the other hand, G component passes the 2nd filter 15 almost as it is. As a filter of such a property, the wavelength-selection nature phase grating indicated by JP,5-66370,A can be used, for example.

[0029] (2) 1/4 wavelength plate 14 disturbs the plane of polarization of the linearly polarized light component which may be produced by a diffraction operation, a refraction operation, etc. of the 2nd filter 15. In addition, if a linearly polarized light component does not arise so much in the 2nd filter 15, you may exclude 1/4 wavelength plate 14.
[0030] (3) The 1st filter 13 divides into a normal beam of light and an extraordinary ray the RGB component which passed 1/4 wavelength plate 14, and only the distance delta x equal to the level pitch Px shifts a mutual image formation position horizontally. According to the above shading-off effects, the light of the 2nd division fraction mixes and carries out incidence to one partition of G component shown in drawing 4 (a). Moreover, the light of the 4th division fraction mixes and carries out incidence to one partition of RB component.
[0031] Consequently, each light-receiving aperture of a RGB component is expanded as shown in drawing 4 (b) - (d), and it fills the whole light-receiving side without a crevice to each. Therefore, it all becomes possible [raising the resolution of three kinds of all color components as much as possible] to produce an unnecessary lap in the light-receiving aperture of each RGB component. Moreover, since a crevice is hardly generated in the light-receiving aperture of each RGB component at this time, a false color and moire can also fully be suppressed about three kinds of all color components.
[0032] When it compares with the conventional example (drawing 17) especially, with the 1st operation gestalt, a lap does not arise at all in the light-receiving aperture of G component. Therefore, it becomes possible to generate a good picture signal especially by raising much more the resolution of G component which contributes to substantial resolution most. Next, another operation gestalt is explained.
[0033] (2nd operation gestalt) The 2nd operation gestalt is an operation gestalt corresponding to invention according to claim 3 to 5. Drawing 5 (a) is drawing showing the composition of the 2nd operation gestalt. In drawing 5 (a), the optical low pass filter 22 is arranged at the image space side of the photography optical system 11. This optical low pass filter 22 is constituted by the lamination of the 1st filter 23 which carries out the birefringence of the light, 1/4 wavelength plate 24 which disturbs plane of polarization, and the 2nd filter 25 which has wavelength-selection nature.
[0034] Behind this optical low pass filter 22, the image pck-up element 26 of a square pixel is arranged through a light filter 27. The pixel output outputted from this image pck-up element 26 is changed into the pixel output of an aspect ratio 2 by being added the perpendicular of every 2 pixels the inside of a scan, and after the completion of a scanning. The field of a light filter 27 doubles a position with a part for this perpendicular of 2 pixels, is classified into the level pitch Px and a normal pitch Py (=2Px), and is classified by RGB3 color by color, respectively.
[0035] Drawing 5 (b) is drawing showing the situation of this color array. Odd lines of a light filter 27 are classified by "GRGR .." by color, and even lines is classified by "GBGB .." by color. Drawing 5 (c) is drawing showing "the shading-off image of ****" by the optical low pass filter 22 mentioned above. An optical operation of following (1) - (3) realizes a shading-off state as shown in this view.
[0036] (1) The 2nd filter 25 carries out the wavelength selection of the RB component, and only distance deltay equal to a normal pitch Py obscures the image formation position of RB component perpendicularly. On the other hand, G component passes the 2nd filter 25 almost as it is. As a filter of such a property, the wavelength-selection nature phase grating indicated by JP,5-66370,A can be used, for example.
[0037] (2) 1/4 wavelength plate 24 disturbs the plane of polarization of the linearly polarized light component which may be produced by a diffraction operation, a refraction operation, etc. of the 2nd filter 25. In addition, if a linearly polarized light component does not arise so much in the 2nd filter 25, you may exclude 1/4 wavelength plate 24.
[0038] (3) The 1st filter 23 divides into a normal beam of light and an extraordinary ray the RGB component which passed 1/4 wavelength plate 24, and only the distance delta x equal to the level pitch Px shifts a mutual image formation position horizontally. According to the above shading-off effects, the light of the 2nd division fraction mixes and carries out incidence to one partition of G component shown in drawing 6 (a). Moreover, the light of the 4th division fraction

mixes and carries out incidence to one partition of RB component.
[0039] Consequently, each light-receiving aperture of a RGB component is expanded as shown in drawing 6 (b) - (d), and it fills the whole light-receiving side without a crevice to each. Therefore, it becomes possible [raising the resolution of three kinds of all color components to the maximum] all for an unnecessary lap to arise in the light-receiving aperture of each RGB component. Moreover, since a crevice is not generated at all in the light-receiving aperture of each RGB component at this time, a false color and moire can also fully be suppressed about three kinds of all color components.
[0040] Moreover, at this time, the configuration of the light-receiving aperture of G component serves as a square, as shown in drawing 6 (b). Therefore, about the picture signal of G component, it becomes possible to generate the picture signal of a square pixel soon, without passing through complicated processing of aspect conversion etc. Therefore, in a computer related field with treating [much] the picture of a square pixel, suitable image pck-up equipment is especially realizable.
 [0041] Furthermore, as for the shading-off direction of the 2nd filter 25, the pitch between the same colors is set as latus perpendicular direction" much more about "RB component. Therefore, it is not generated in the light-receiving aperture of RB component, and a lap does not spoil the resolution of RB component in it more than required. Moreover, since the light which penetrated the 1st division fraction of a light filter 27 is received by part for two of a photo detector 28, it also becomes possible to use the image pck-up element 26 of a general square pixel. Next, another operation gestalt is explained.
[0042] (3rd operation gestalt) The 3rd operation gestalt is an operation gestalt corresponding to invention according to claim 3 to 5. Drawing 7 is drawing for explaining the 3rd operation gestalt. As for the constitutional focus in the 3rd operation gestalt, odd lines of a light filter are classified by "GRGB .." by color, and even lines is a point currently classified by "GBGR .." by color. In addition, about other composition, since it is the same as that of the 2nd operation gestalt, composition explanation here is omitted.
[0043] Each light-receiving aperture of a RGB component is expanded as shown in drawing 7 , and it fills the whole light-receiving side with such composition without a crevice to each. Therefore, also in the 3rd operation gestalt, it becomes possible to acquire the same effect as the 2nd operation gestalt. Moreover, as an effect peculiar to the 3rd operation gestalt, the light-receiving aperture of RB component is the point aslant located in a line a half-phase every, shifting. By the array of such a light-receiving aperture, it also becomes possible to raise the substantial resolution of RB component. Next, another operation gestalt is explained.
[0044] (4th operation gestalt) The 4th operation gestalt is an operation gestalt corresponding to invention according to claim 3 to 5. Drawing 8 is drawing for explaining the 4th operation gestalt. As for the constitutional focus in the 4th operation gestalt, odd lines of a light filter are classified by "GRGR .." by color, and even lines is a point currently classified by "BGBG .." by color. In addition, about other composition, since it is the same as that of the 2nd operation gestalt, composition explanation here is omitted.
[0045] Each light-receiving aperture of a RGB component is expanded as shown in drawing 8 , and it fills the whole light-receiving side with such composition without a crevice to each. Therefore, also in the 4th operation gestalt, it becomes possible to acquire the same effect as the 2nd operation gestalt. Moreover, as an effect peculiar to the 4th operation gestalt, it is the point that the light-receiving aperture of G component is located in a line with a slanting grid. By the array of such a light-receiving aperture, it also becomes possible to raise the substantial resolution of G component.
[0046] (5th operation gestalt) The 5th operation gestalt is an operation gestalt corresponding to invention according to claim 3 to 5. Drawing 9 is drawing for explaining the 5th operation gestalt. The constitutional focus in the 5th operation gestalt is the following two points.
[0047] (1) The level line of a light filter is classified by color in the shape of a stripe by "GRGB .."
[0048] (2) The same color pitch of RB component is set as a latus horizontal direction for the shading-off direction of the 2nd filter. In addition, about other composition, since it is the same as that of the 2nd operation gestalt, composition explanation here is omitted. Each light-

receiving aperture of a RGB component is expanded as shown in drawing 9 , and it fills the whole light-receiving side with such composition without a crevice to each. Therefore, also in the 5th operation gestalt, it becomes possible to acquire the same effect as the 2nd operation gestalt.
[0049] if it considers as an effect peculiar to the 5th operation gestalt especially, it is the point the perpendicular phase of the light-receiving aperture of RB component and whose perpendicular phase of the light-receiving aperture of G component correspond Thus, since the mutual perpendicular phase is in agreement beforehand, it becomes possible [generating easily the picture signal which was in phase and arranged the RGB component altogether]. Next, another operation gestalt is explained.
[0050] (6th operation form) The 6th operation form is an operation form corresponding to invention according to claim 3 to 5. Drawing 10 is drawing for explaining the 6th operation form. The constitutional focus in the 6th operation form is the following two points.
[0051] (1) Odd lines of a light filter are classified by "GRGB .." by color, and even lines is classified by "GBGR .." by color.
[0052] (2) The same color pitch of RB component is set as a latus horizontal direction for the shading-off direction of the 2nd filter. In addition, about other composition, since it is the same as that of the 2nd operation gestalt, composition explanation here is omitted. Each light-receiving aperture of a RGB component is expanded as shown in drawing 10 , and it fills the whole light-receiving side with such composition without a crevice to each. Therefore, also in the 6th operation gestalt, it becomes possible to acquire the same effect as the 2nd operation gestalt.
[0053] Moreover, as an effect peculiar to the 6th operation gestalt, the light-receiving aperture of RB component is the point aslant located in a line a half-phase every, shifting. By the array of such a light-receiving aperture, it also becomes possible to raise the substantial resolution of RB component. Furthermore, with the 6th operation gestalt, the perpendicular phase of the light-receiving aperture of RB component and the perpendicular phase of the light-receiving aperture of G component are in agreement. Thus, since a mutual perpendicular phase is in agreement beforehand, it becomes possible [generating easily the picture signal which was in phase and arranged the RGB component altogether]. Next, another operation gestalt is explained.
[0054] (7th operation gestalt) The 7th operation gestalt is an operation gestalt corresponding to invention according to claim 3 to 5. Drawing 11 is drawing for explaining the 7th operation gestalt. The constitutional focus in the 7th operation gestalt is the following two points.
[0055] (1) Odd lines of a light filter are classified by "GRGB .." by color, and even lines is classified by "RGBG .." by color.
[0056] (2) The same color pitch of RB component is set as a latus horizontal direction for the shading-off direction of the 2nd filter. In addition, about other composition, since it is the same as that of the 2nd operation gestalt, composition explanation here is omitted. Each light-receiving aperture of a RGB component is expanded as shown in drawing 11 , and it fills the whole light-receiving side with such composition without a crevice to each. Therefore, also in the 7th operation gestalt, it becomes possible to acquire the same effect as the 2nd operation gestalt.
[0057] Moreover, the light-receiving aperture of G component is located in a line with a slanting grid with the 7th operation gestalt. Moreover, while 1/4 phase of light-receiving apertures of RB component shifts at a time, it stands in a line aslant. By the array of such a light-receiving aperture, it also becomes possible to raise the substantial resolution of a RGB component. Furthermore, with the 7th operation gestalt, the perpendicular phase of the light-receiving aperture of RB component and the perpendicular phase of the light-receiving aperture of G component are in agreement. Thus, since a mutual perpendicular phase is in agreement beforehand, it becomes possible [generating easily the picture signal which was in phase and arranged the RGB component altogether]. Next, another operation gestalt is explained.
[0058] (Operation gestalt of the octavus) The operation gestalt of the octavus is an operation gestalt corresponding to invention according to claim 3 to 5. Drawing 12 is drawing for explaining the operation gestalt of the octavus. In the odd number train and even number train of a light filter, the color array of the constitutional focus in the operation gestalt of the octavus is the

shifting point a half-phase every perpendicularly.
[0059] In an image pck-up element side, according to phase staggering of this color array, the block of a photo detector 28 is set up, as shown in drawing 13 (b). By adding a pixel output per block of such a photo detector 28, it becomes possible to generate the pixel output of a color array as shown in drawing 13 (a), using the image pck-up element of a square pixel. In addition, it may perform, addition operation here performing independently perpendicular transfer operation of a pixel output in an odd number train and an even number train, and in case an image processing is performed in the exterior of an image pck-up element, you may perform.
[0060] In addition, about other composition, since it is the same as that of the 2nd operation gestalt, composition explanation here is omitted. Each light-receiving aperture of a RGB component is expanded as shown in drawing 12 , and it fills the whole light-receiving side with such composition without a crevice to each. Therefore, also in the operation gestalt of the octavus, it becomes possible to acquire the same effect as the 2nd operation gestalt.
[0061] Moreover, with the operation gestalt of the octavus, the perpendicular phase for one light-receiving aperture of RB component is in agreement with the perpendicular phase for two light-receiving apertures of G component. Thus, since the mutual perpendicular phase is in agreement beforehand, it becomes possible [generating easily the picture signal which was in phase and arranged the RGB component altogether]. Next, another operation gestalt is explained.
[0062] (9th operation gestalt) The 9th operation gestalt is an operation gestalt corresponding to invention according to claim 3 to 5. Drawing 14 is drawing for explaining the 9th operation gestalt. The constitutional focus in the 9th operation gestalt is the following two points.
[0063] (1) In the odd number train and even number train of a light filter, a color array shifts perpendicularly a half-phase every.
[0064] (2) R component and B component are arranged on an even number train at a checker. In addition, about other composition, since it is the same as that of the 2nd operation gestalt, composition explanation here is omitted. Each light-receiving aperture of a RGB component is expanded as shown in drawing 14 , and it fills the whole light-receiving side with such composition without a crevice to each. Therefore, also in the 9th operation gestalt, it becomes possible to acquire the same effect as the 2nd operation gestalt.
[0065] Moreover, with the 9th operation form, the perpendicular phase for one light-receiving aperture of RB component is in agreement with the perpendicular phase for two light-receiving apertures of G component. Thus, since the mutual perpendicular phase is in agreement beforehand, it becomes possible [generating easily the picture signal which was in phase and arranged the RGB component altogether]. Moreover, with the 9th operation form, while the light-receiving aperture of RB component shifts a half-phase every, it stands in a line aslant. By the array of such a light-receiving aperture, it also becomes possible to raise the substantial resolution of RB component. Next, another operation form is explained.
[0066] (10th operation form) The 10th operation form is an operation form corresponding to invention according to claim 3 to 5. Drawing 15 is drawing for explaining the 10th operation form. The constitutional focus in the 10th operation form is the following two points.
[0067] (1) In the odd number train and even number train of a light filter, a color array shifts perpendicularly a half-phase every.
[0068] (2) R component and B component are arranged on an even number train at a vertical stripe.
[0069] (3) The same color pitch of RB component is set as a latus horizontal direction for the shading-off direction of the 2nd filter. In addition, about other composition, since it is the same as that of the 2nd operation gestalt, composition explanation here is omitted. Each light-receiving aperture of a RGB component is expanded as shown in drawing 15 , and it fills the whole light-receiving side with such composition without a crevice to each. Therefore, also in the 10th operation gestalt, it becomes possible to acquire the same effect as the 2nd operation gestalt. Moreover, with the 10th operation gestalt, the level phase for one light-receiving aperture of RB component is in agreement with the level phase for two light-receiving apertures of G component. Thus, since the mutual level phase is in agreement beforehand, it becomes

possible [generating easily the picture signal which was in phase and arranged the RGB component altogether].
[0070] (Variation of an operation gestalt etc.) In addition, with each operation gestalt mentioned above, since the distance which obscures a light figure is made in agreement with Px and Py, neither a crevice nor a lap arises at all in the light-receiving aperture, but it becomes possible to obtain the resolution of image pck-up equipment, and the numerical aperture of a light-receiving aperture to the maximum extent. However, this invention is not limited to this. It becomes possible to acquire the effect of this invention by [by which abbreviation etc. generally spreads the distance which obscures a light figure on Px and Py] carrying out. For example, they are the distance delta x which obscures a light figure horizontally, and distance deltay which obscures perpendicularly <=(0.6Px) deltax<= (1.5Px)
(0.6Py) <=deltay<= (1.5Py)
Even if it sets up by ********, it becomes possible to suppress a false color and moire also with some.
[0071] Moreover, although each operation gestalt mentioned above explained the case where the filter in which light carries out a birefringence was used as the 1st filter, this invention is not limited to this. Generally, if it is the optical element to which only predetermined distance obscures a light figure, it can be used as an optical low pass filter. For example, you may use the optical low pass filter which used the phase grating.
[0072] Furthermore, although each operation gestalt mentioned above explained the case where a wavelength-selection nature phase grating was used, as the 2nd filter, this invention is not limited to this. If it is the optical element from which it obscures with wavelength and an amount generally changes, it can be used as the 2nd filter. Moreover, with each operation gestalt mentioned above, although stuck in order of "the 2nd filter -> 1st filter" along with an optical path, it is not limited to this. Reverse is sufficient as this turn and it may arrange independently, without sticking both filters. (However, when using a phase grating, it is necessary to care about the point of doubling the interval of an image pck-up element and a phase grating with the set point at the time of a phase grating design)
Furthermore, with each operation gestalt mentioned above, although three kinds of color components were explained, this invention is not limited to this. For example, a mode, such as assigning two colors or four colors or more, can be considered as a color component (for example, when applying this invention to the image pck-up element of one of the two of 2 board type image pck-up equipment). Moreover, with the operation gestalt mentioned above, although the 1st division fraction of a color array is assigned to two photo detectors, it is not limited to this. For example, as shown in drawing 13 (c), one partition of a color array may consist of one photo detector. Moreover, it is easy to be natural even if it constitutes one partition of a color array from a block of three or more photo detectors.
[0073]
[Effect of the Invention] (Claim 1) In invention according to claim 1, the 2nd filter has the wavelength-selection nature "whether it is smaller than the amount of shading ofves of other color components, and the amount of shading ofves of the 1st color component is efficiency top zero." Therefore, about the 1st color component, the amount of shading ofves of the 2nd direction becomes small, and becomes possible [raising the resolution of the 2nd direction].
[0074] In addition, in an image pck-up means, since the sample interval of the 1st color component is the finest, the clinch noise made to the sampling signal of the 1st color component is shifted more to a high region side compared with the case of other color components. Therefore, about the 1st color component, even if it reduces the amount of shading ofves as mentioned above, there are few possibilities that a false color and moire may occur. As explained above, in invention according to claim 1, it becomes possible to realize the image pck-up equipment which does not spoil resolution as much as possible, fully suppressing a false color and moire.
[0075] (Claim 2) By invention according to claim 2, as shown in drawing 1 (b) - (d), the whole light-receiving side can be worn by the light-receiving aperture about three kinds of each color component which makes a Bayer array that there is almost no lap. Therefore, it becomes

possible not to spoil resolution more than required and to suppress a false color and moire enough about three kinds of all color components. Thus, in invention according to claim 2, it becomes possible to acquire the good picture signal which reconciled the depressor effect of a false color or moire, and the improvement effect of resolution to the maximum extent about three kinds of all color components.

[0076] (Claim 3) In invention according to claim 3, the light-receiving aperture of the 1st color component becomes square-like mostly. Therefore, about the 1st color component, it becomes possible to acquire the picture signal of the pixel aspect ratio 1:1 easily, without passing through complicated computations, such as aspect conversion. Therefore, in invention according to claim 3, the suitable image pck-up equipment for a computer related field with treating [much] the picture of a square pixel etc. is realizable.

[0077] (Claim 4) In invention according to claim 4, other color components are obscured in the large direction of the pitch between the same colors with the 2nd filter. Therefore, the light-receiving aperture of other color components becomes there are few heavy bird clappers between the same colors, and possible [raising the resolution of other color components as much as possible].

[0078] (Claim 5) In invention according to claim 5, since one partition of a color array is received by the photo detector for two, it becomes possible to use the general image pck-up element which consisted of square pixels. Therefore, it becomes possible for it to become unnecessary to use the image pck-up element which consists of a special long direction pixel, and to realize the image pck-up equipment of a publication easily to claims 3 and 4.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing explaining invention according to claim 2.
[Drawing 2] It is drawing for explaining invention according to claim 3 to 5.
[Drawing 3] It is drawing showing the composition of the 1st operation gestalt.
[Drawing 4] It is drawing explaining operation of the 1st operation gestalt.
[Drawing 5] It is drawing showing the composition of the 2nd operation gestalt.
[Drawing 6] It is drawing explaining operation of the 2nd operation gestalt.
[Drawing 7] It is drawing for explaining the 3rd operation gestalt.
[Drawing 8] It is drawing for explaining the 4th operation gestalt.
[Drawing 9] It is drawing for explaining the 5th operation gestalt.
[Drawing 10] It is drawing for explaining the 6th operation gestalt.
[Drawing 11] It is drawing for explaining the 7th operation gestalt.
[Drawing 12] It is drawing (1/2) for explaining the operation gestalt of the octavus.
[Drawing 13] It is drawing (2/2) for explaining the operation gestalt of the octavus.
[Drawing 14] It is drawing for explaining the 9th operation gestalt.
[Drawing 15] It is drawing for explaining the 10th operation gestalt.
[Drawing 16] It is drawing showing the composition of a train conventionally.
[Drawing 17] It is drawing explaining operation of the conventional example.
[Description of Notations]
11 81 Photography optical system
12, 22, 82 Optical low pass filter
13, 23, 83 The 1st filter
14, 24, 84 1/4 wavelength plate
15, 25, 85 The 2nd filter
16, 26, 86 Image pck-up element
17, 27, 87 Light filter

[Translation done.]